Amendments to the Claims

This listing of claims will replace all prior versions, and listings, of claims in the application:

Listing of Claims:

Claim 1 (Currently Amended): A scanning antenna diversity system for FM radio for vehicles, having an antenna system ~~(1)~~ having a controllable logic switching device ~~(2)~~, in which a different high-frequency reception signal ~~(5)~~, in terms of diversity, is passed to a receiver ~~(3)~~ with different switching positions, in each instance, and an IF reception signal ~~(9)~~ at the output of the receiver ~~(3)~~ derived from this reception signal ~~(5)~~ is coupled to the input of a diversity processor ~~(4)~~, which switches the logic switching device ~~(2)~~ into a different switching position if there is reception interference, wherein the diversity processor ~~(4)~~ comprises;

a first interference detector ~~(6)~~ having its input coupled to the IF reception signal (5), and whose momentary interference indicator signal ~~(10)~~ at its output is obtained without delay from the momentary value, in terms of time, of the IF reception signal ~~(9)~~ of the receiver ~~(3)~~, which is limited to the IF bandwidth, by means of determining the interference-related occurrence of impermissible momentary values of the frequency and the amplitude of this signal,

a second interference detector ~~(7)~~ having its input coupled to the IF reception signal ~~(5)~~ whose interference indicator signal ~~(11)~~ at its output is obtained from the same IF reception signal ~~(9)~~, but from a time-integral determination of the interference signal contents in frequency gaps kept free of the wanted signal according to the signal standardization of the FM multiplex signals of the FM demodulated IF reception signal (9a); and,

a logic circuit ~~(0)~~ coupled to the output of said first and second interference detectors ~~(6,7)~~ for receiving said two interference indicator signals ~~(10, 11)~~ and producing at its output a logic control signal ~~(12)~~ that is connected to the controllable logic switching device ~~(2)~~ for controlling the antenna system ~~(1)~~, said logic circuit ~~(0)~~ evaluating said interference indicator signals ~~(10, 11)~~ of the two interference detectors ~~(6, 7)~~, so that a different switching position is selected at the earliest possible point in time after the occurrence of a reception signal ~~(5)~~ that has become unworthy of reception.

Claim 2 (Currently Amended): The scanning antenna diversity system according to claim 1, wherein said logic circuit ~~(0)~~ comprises a programmable microprocessor ~~(13)~~ whose sequence program is built up upon the evaluation of the interference

indicator signals ~~(10, 11)~~ according to size and time sequence, taking into consideration their known different characteristics with regard to the different interference causes, and logic links these assessments to provide the switching commands in said logic control signal ~~(12)~~.

Claim 3 (Currently Amended): The scanning antenna diversity system according to claim 2 wherein said two interference detectors ~~(6, 7)~~ are structured using analog technology, and that the momentary interference indicator ~~(10)~~ of said first interference detector ~~(6)~~, obtained from the FM demodulated IF reception signal ~~(9a)~~ and said interference indicator ~~(11)~~ of said second interference detector ~~(7)~~, after analog/digital conversion, are evaluated in said programmable microprocessor ~~(13)~~ that functions digitally, in accordance with a suitably configured protocol, to form said logic control signal ~~(12)~~.

Claim 4 (Currently Amended): The scanning antenna diversity system according to claim 1, wherein said first interference detector ~~(6)~~, includes an FM demodulator ~~(17)~~ having a frequency deviation threshold ~~(18)~~ that corresponds to the maximally permissible frequency deviation for the high-frequency reception signal ~~(5)~~ without interference, said momentary interference indicator signal ~~(10)~~ being formed from the momentary frequency

deviation that exceeds the frequency deviation threshold ~~(10)~~, as a result of the occurrence of a frequency deviation in the total signal, within an interference recognition time t_s of maximally only a small multiple of the reciprocal IF bandwidth, at $t_s < 100$ µs.

Claim 5 (Currently Amended): The scanning antenna diversity system according to claim 1, comprising an AM rectifier ~~(15)~~ coupled to the input said first interference detector ~~(6)~~ and an interference amplitude modulation indicator ~~(19)~~ in the first interference detector ~~(6)~~, said momentary interference indicator signal ~~(10)~~ being formed from the occurrence of an amplitude interference modulation in the total signal, within an interference recognition time t_s of maximally only a small multiple of the reciprocal IF bandwidth, at $t_s < 100$ µs.

Claim 6 (Currently Amended): The scanning antenna diversity system according to claim 2, where said first interference detector ~~(6)~~ comprises an FM demodulator ~~(17)~~ having a frequency deviation threshold ~~(10)~~, and an AM rectifier ~~(15)~~ having an interference amplitude modulation indicator ~~(19)~~ wherein said momentary interference indicator signal ~~(10)~~ is formed from the simultaneous occurrence of the interference-related frequency deviation and the amplitude interference modulation.

Claim 7 (Currently Amended): The scanning antenna diversity system according to claim 1, wherein said second interference detector ~~(7)~~ comprises at least one frequency filter ~~(20)~~ for uncoupling of interference signals in a frequency gap that is kept free of the wanted signal, according to the signal standardization of the FM multiplex signal of the FM demodulated IF reception signal ~~(9a)~~, and that the interference energy contained in the interference signals is evaluated by means of time integration, to form said interference indicator signal ~~(11)~~, within a time of $t_q < 10$ ms.

Claim 8 (Currently Amended): The scanning antenna diversity system according to claim 7, wherein said frequency filter ~~(20)~~ is configured as a high-pass filter ~~(29)~~ for uncoupling interference signals in the frequency range above the highest frequency that occurs in the standardized FM multiplex signal, the lower limit frequency of which is selected to be sufficiently low to detect all interference, and the flank steepness of which is selected to be sufficiently high to suppress the wanted signal content at the filter output.

Claim 9 (Currently Amended): The scanning antenna diversity system according to claim 7, wherein said frequency filter ~~(20)~~

comprises a combined filter, consisting of band-pass filters ~~(30)~~ in the pass-through frequency ranges 15 kHz < f < 19 kHz and 19 kHz < f < 23 kHz, as well as of a high-pass filter with 57 kHz < f.

Claim 10 (Currently Amended): The scanning antenna diversity system according to claim 7, wherein said frequency filter ~~(20)~~ for evaluation of the interference signals in the frequency ranges 15 kHz < f < 19 kHz and 19 kHz < f < 23 kHz is formed by frequency conversion with a carrier oscillation on the pilot frequency, with a subsequent low-pass filter with the limit frequency of < 4 kHz.

Claim 11 (Currently Amended): The scanning antenna diversity system according to claim 7, wherein said second interference detector ~~(7)~~ comprises a rectifier circuit ~~(21)~~ with integration element ~~(22)~~ coupled to the output of said at least one frequency filter ~~(20)~~ for evaluation of the interference energy N that occurs in the interference signals.

Claim 12 (Currently Amended): The scanning antenna diversity system according to claim 7, wherein said at least one frequency filter ~~(20)~~ includes a wanted signal filter ~~(23)~~ for uncoupling wanted signal contents S from said FM demodulated IF

reception signal ~~(9a)~~ on frequencies provided for the transmission of wanted signals, according to the signal standardization of the FM multiplex signal of said FM demodulated IF reception signal ~~(9a)~~, for time-integral determination of the wanted signal energy S, and that the signal/noise ratio S/N is determined in a time of t_q < 10 ms after occurrence of the interference and included in the formation of said logic control signal ~~(12)~~.

Claim 13 (Currently Amended): The scanning antenna diversity system according to claim 11, comprising a signal/noise ratio threshold circuit ~~(24)~~ having a predetermined threshold, and coupled to the output of said integration element ~~(22)~~, and said logic circuit ~~(8)~~ is programmed so that if the signal/noise ratio S/N has gone below this threshold value, said threshold circuit ~~(24)~~ generates a logic control signal ~~(12)~~ at the time point t_1, which causes the antenna logic switching device ~~(2)~~ to be switched further only if said first interference detector ~~(6)~~ has not indicated any interference during the time interval t_i-Dt < t < t_1, whereby Dt is given by the recognition time of said second interference detector ~~(7)~~.

Claim 14 (Currently Amended): The scanning antenna diversity system according to claim 2, wherein in said first

interference detector ~~(6)~~, the momentary interference indicator signal ~~(10)~~ is given as a binary signal ~~(14)~~ and that the frequency deviation threshold ~~(18)~~ is structured in variable manner, in such a manner that it is set as a function of the actual modulation stroke that is averaged, over time, by way of a suitably set integration time, and is raised according to a predetermined function with an increasing modulation stroke.

Claim 15 (Currently Amended): Scanning antenna diversity system according to claim 14, wherein said first interference detector ~~(6)~~ has an amplitude interference modulation threshold signal ~~(26)~~ and said interference indicator signal ~~(11)~~ are provided as a binary signal ~~(14)~~ if this threshold is exceeded, and said momentary interference indicator signal ~~(10)~~ is given as a binary signal ~~(14)~~ by means of the simultaneous occurrence that the frequency deviation threshold ~~(18)~~ and the amplitude interference modulation threshold ~~(26)~~ have been exceeded.

Claim 16 (Currently Amended): The scanning antenna diversity system according to claim 15, wherein said amplitude interference modulation threshold ~~(26)~~ is configured to be variable, so that it is set as a function of the actual AM demodulated IF reception signal ~~(9b)~~ of the IF reception signal ~~(9)~~, averaged by way of a suitably set integration time, and that said amplitude

interference modulation threshold ~~(26)~~ is raised according to a predetermined function, with an increasing size of this signal.

Claim 17 (Currently Amended): The scanning antenna diversity system according to claim 14 wherein the time intervals between consecutive intervals of exceeding the frequency deviation threshold ~~(12)~~ or/and the amplitude interference modulation threshold ~~(26)~~ in said first interference detector are detected in said logic circuit ~~(8)~~ and are used as a criterion for the quality of the high-frequency reception signal ~~(5)~~, and that the frequency deviation threshold ~~(12)~~ or/and the amplitude interference modulation threshold ~~(26)~~ is/are raised as the time intervals become shorter, in order to reduce the switching unrest.

Claim 18 (Currently Amended): The scanning antenna diversity system according to claim 1 wherein said first interference detector ~~(6)~~ is a processor of the type TEA 6101 of the Philips Company, or having a similar specification.

Claim 19 (Currently Amended): The scanning antenna diversity system according to claim 14 wherein the actual time averages of the FM demodulated IF reception signal ~~(9a)~~ and the AM demodulated IF reception signal ~~(9b)~~ are passed to said

microprocessor ~~(13)~~ to be A/D converted, and signals are generated, using a computer program and subsequent D/A conversion, which are passed to said first interference detector ~~(6)~~ for controlling the frequency deviation threshold ~~(12)~~ and the amplitude interference modulation threshold ~~(26)~~.

Claim 20 (Currently Amended): The scanning antenna diversity system according to claim 13 wherein when the system works in a signal selection mode, addressable switching states ~~(27)~~ are provided in the logic switching device ~~(2)~~, and during operation of the system according to claim 13, for the different switching states ~~(27)~~, the actual time intervals between the subsequent switching processes of the logic switching device ~~(2)~~ for the different switching states ~~(27)~~ are separately determined as a criterion for the quality of the high-frequency reception signal ~~(5)~~, and the logic circuit ~~(8)~~ is configured as a microprocessor ~~(13)~~ having memory and sorting functions, by means of which a ranking of the high-frequency reception signals ~~(5)~~ assigned to the addressable switching states ~~(27)~~ is formed, with regard to the quality of these signals, and if a momentary interference indicator signal ~~(10)~~ or an interference indicator signal ~~(11)~~ occurs, a next switching state ~~(27)~~ is selected, by an appropriately generated address signal corresponding to the next position in the ranking.

Claim 21 (Currently Amended): The scanning antenna diversity system according to claim 20 wherein for the different switching states ~~(27)~~, the audio quality is separately determined from the signal/noise ratio S/N determined in said second interference detector ~~(7)~~, and that this signal is used to monitor the audio quality and to switch between different operating modes of the scanning antenna diversity system as a criterion of the quality of the high-frequency reception signal ~~(5)~~, and that the ranking of the high-frequency signals ~~(5)~~ assigned to the addressable switching states ~~(27)~~ is formed with regard to the quality of these signals.

Claim 22 (Currently Amended): The scanning antenna diversity system according to claim 20 wherein the system works in an updating mode, wherein the addressable switching states ~~(27)~~ are cyclically switched further to a different addressable switching state ~~(27)~~ every time a momentary interference indicator signal ~~(10)~~ occurs in said first interference detector ~~(6)~~ or an interference indicator signal ~~(11)~~ occurs in the second interference detector ~~(7)~~, in order to update the ranking, until all the addressable switching states ~~(27)~~ have been selected and the actual time intervals have been reliably determined at least once.

Claim 23 (Currently Amended): The scanning antenna diversity system according to claim 13, wherein a signal corresponding to the perceived audio quality is produced from the signal/noise ratio S/N determined in said second interference detector ~~(7)~~, and that this signal is used to monitor the audio quality and to switch between different operating modes of the scanning antenna diversity system.

Claim 24 (Currently Amended): The scanning antenna diversity system according to claim 22, wherein said logic circuit ~~(8)~~ is programmed so that if the audio quality that is averaged over time and found to be sufficient by said second interference detector ~~(7)~~, the diversity system is operated in a momentary switching mode, consisting of a combination of, said signal selection mode controlled by said first interference detector ~~(6)~~, which is interrupted by said updating cycle at suitably selected time intervals ~~(20)~~ and, the signal selection mode which is reactivated after this cycle has been run.

Claim 25 (Currently Amended): The scanning antenna diversity system according to claim 23, wherein the logic circuit is configured so that if the audio quality averaged over time, is found to be too low by said second interference detector ~~(7)~~, in

combination with time intervals between the consecutive instances of exceeding the frequency deviation threshold ~~(12)~~ or/and the amplitude interference threshold ~~(26)~~ in said first interference detector ~~(6)~~, the diversity system is operated in the S/N mode in which the momentary interference indicator signals ~~(10)~~ are left out of consideration in forming the logic control signal ~~(12)~~, and said logic control signal ~~(12)~~ is exclusively derived from said interference indicator signal ~~(11)~~ of said second interference detector ~~(7)~~.

Claim 26 (Currently Amended): The scanning antenna diversity system according to claim 25, wherein the system is operated in S/N mode, and works in an S/N signal selection mode in which addressable switching states ~~(27)~~ are provided in the logic switching device ~~(2)~~, and the actual signal/noise ratio S/N of the different switching states ~~(27)~~ is separately determined for the different switching states ~~(27)~~ as a criterion of the audio quality of the high-frequency reception signal ~~(5)~~, and said logic circuit ~~(8)~~ is structured as a microprocessor ~~(13)~~ having memory and sorting functions, which are used to form a ranking of the high-frequency reception signals ~~(5)~~ assigned to the addressable switching states ~~(27)~~, with regard to the audio quality of these signals, and if an interference indicator signal ~~(11)~~ occurs, where the value goes below a signal/noise ratio threshold ~~(24)~~, a

next switching state ~~(27)~~ is selected by an appropriately generated address signal, corresponding to the next position in the ranking.

Claim 27 (Currently Amended): The scanning antenna diversity system according to claim 26, wherein the system works in a S/N mode wherein said logic circuit ~~(8)~~ is programmed so that if the audio quality that is averaged over time by said second interference detector ~~(7)~~, in combination with momentary interference indicator signals that follow one another at very small time intervals, these momentary signals are ignored when the logic control signal ~~(12)~~ is formed, and in an S/N updating cycle, in which the addressable switching states ~~(27)~~ are cyclically switched further to a different addressable switching state ~~(27)~~, whenever an interference indicator signal ~~(11)~~ occurs in said second interference detector ~~(7)~~, until all the addressable switching states ~~(27)~~ have been selected and the actual signal/noise ratios S/N have been reliably determined at least once.

Claim 28 (Currently Amended): The scanning antenna diversity system according to claim 27, wherein the diversity system is operated in a S/N switching mode, whereby a combination of the S/N signal selection mode controlled by said second interference

detector ~~(7)~~, which is interrupted by the S/N updating cycle, at suitably selected time intervals ~~(20)~~, and after this cycle has been run, the S/N signal selection mode is reactivated.

Claim 29 (Currently Amended): The scanning antenna diversity system according to claim 24, wherein the time intervals ~~(20)~~ are adapted to the changing amplitude of the high-frequency reception signal ~~(5)~~ that changes with the driving speed, according to the Rayleigh field distribution, and are selected to be shorter with an increasing driving speed.

Claim 30 (Currently Amended): The scanning antenna diversity system according to claim 29, wherein the time intervals ~~(20)~~ are derived from the time intervals determined according to claims 17, 20, and 22, so that at the shortest determined time intervals, smaller time intervals ~~(20)~~ are set for more frequent updating of the ranking of the high-frequency reception signals ~~(5)~~.

Claim 31 (Currently Amended): The scanning antenna diversity system according to claim 24, wherein in the S/N mode, the FM demodulated IF reception signal ~~(9a)~~ or the AM demodulated IF reception signal ~~(9b)~~ is passed to said first interference detector ~~(6)~~ for dynamic adjustment of the frequency deviation threshold ~~(18)~~, or of the amplitude interference modulation

threshold ~~(26)~~, respectively, for the purpose of making available updated thresholds for the transition to the momentary switching mode.

Claim 32 (Currently Amended): The scanning antenna diversity system according to claim 1, wherein said logic circuit ~~(8)~~ is programmed so that in order to prevent undesirable additional switching activity after a switch instruction has been issued to the logic switching device ~~(2)~~ by said logic control signal ~~(12)~~, a waiting time ~~(25)~~ is in effect, within which no further switching instructions are passed on to the logic switching device ~~(2)~~, and which is slightly greater than the sum of the delay time resulting from the effective band limitation as a result of the intermediate frequency filters and from the other unavoidable dead times of the signal processing components.

Claim 33 (Currently Amended): The scanning antenna diversity system according to claim 1, wherein the IF reception signal ~~(9)~~ is digitalized in a digitally operating signal processing DSP, and that all the functions of the system are implemented by means of digital signal processes.